

Abstract No. Resn0319

**Determination of the Electronic and Magnetic Structures of  $\text{Sr}_2\text{FeMoO}_6$  by Polarized X-ray Absorption**

D. Resnick, Y. U. Idzerda, J. Dvorak, D. Arena, A. Lussier, E. Negusse (Montana State U) S. B. Ogale and V. Venkatesan (U of Maryland)  
Beamline(s): U4B

**Introduction:** The double perovskite  $\text{Sr}_2\text{FeMoO}_6$  has been established as a new CMR material. We have examined the electronic and magnetic structures of  $\text{Sr}_2\text{FeMoO}_6$  with x-ray absorption spectroscopy (XAS) and x-ray magnetic circular dichroism (XMCD), and have compared it to recent results. [1] Strontium Iron Molybdenum Oxide ( $\text{Sr}_2\text{FeMoO}_6$ ) is a very exciting new material. Its double perovskite structure leads many to think that it has some very unique and useful properties. Its considerable magnetoresistance at low fields and room temperature make it useful technologically, such as in spin devices. We are doing this study to probe its electronic and magnetic structure to answer some of the open questions regarding its most basic properties. Also, this material is reputed to be a half-metallic ferromagnet, a ferromagnet which is 100% spin polarized (only the majority spins contribute to conduction at the fermi level).

**Methods and Materials:** The samples were grown by pulsed laser deposition at the University of Maryland. The data was taken using x-ray absorption spectroscopy (XAS) and x-ray magnetic circular dichroism (XMCD) at the MSU Magnetic Materials x-ray Characterization Facility at Beamline U4B of the Nat. Sync. Light Source (NSLS).

**Results:** These graphs (Figure 1 and 2) both represent x-ray absorption spectra at the L edge of iron in  $\text{Sr}_2\text{FeMoO}_6$ . Additionally, in the left graph (Figure 1) the L edges of iron in other valence states are included for comparison. A double peaked  $\text{L}_3$  edge in  $\text{Sr}_2\text{FeMoO}_6$  is clearly identifiable, suggestive of a mixed valence state of iron. This feature is absent in Ray's data [1] shown on the right (Figure 2). Ray's graph does not show it, but at higher resolution they detected a small shoulder on the left corresponding to  $\text{Fe } 3^+$ .

**Conclusions:** We see the double peak on the  $\text{L}_3$  and  $\text{L}_2$  edge of iron for  $\text{Sr}_2\text{FeMoO}_6$ . This data supports the supposition that the iron in  $\text{Sr}_2\text{FeMoO}_6$  is in a mixed valence state of  $2^+$  and  $3^+$ , and not in just a  $3^+$  state as Ray's data supports.

**Acknowledgments:** This work was supported by ONR (D. Resnick, Y. Idzerda) and NSF-MRSEC DMR 00-80008 (S. Ogale, S. Shinde, and V. Venkatesan). NSLS is supported by DOE. Highlight this text and type over it with any acknowledgments you may have; otherwise, delete this line

**References:** [1] Sugata Ray, Aswani Kumar, D. D. Sarma *et al.*, Phys. Rev. Lett., **87**, 097204 (2001)

Figure 1

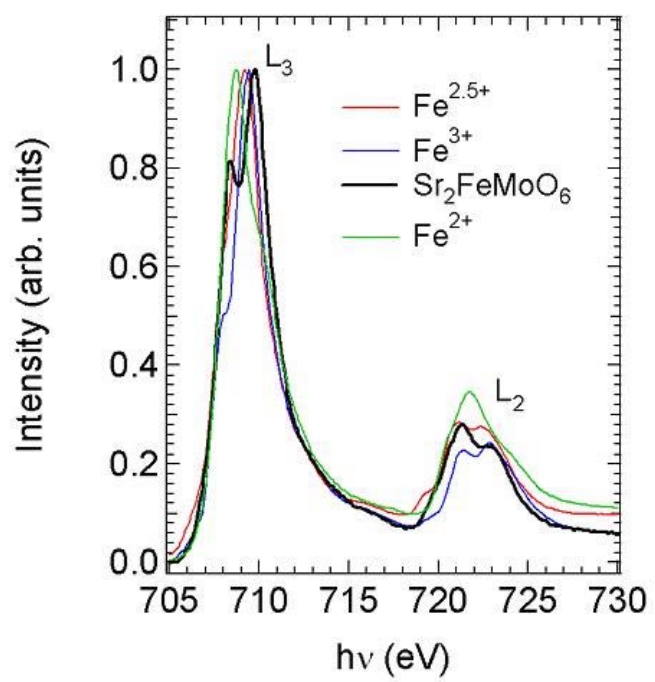


Figure 2

